

1 VENDING MACHINE ADAPTED TO VEND AGE-RESTRICTED ITEMS

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3 This application is a continuation-in-part of U.S. Serial No.
4 09/657,719, filed September 8, 2000, entitled "A Point-Of-Sale
5 Commercial Transaction Processing System Using Artificial
6 Intelligence Assisted By Human Intervention", the complete
7 disclosure of which is hereby incorporated by reference herein.

8
9 BACKGROUND OF THE INVENTION
10

11 1. Field of the Invention

12 The invention relates to vending machines. More
13 particularly, the invention relates to a vending machine which is
14 adapted to vend age-restricted items.

15
16 2. State of the Art

17 Most vending machines have a simple mechanical interface
18 through which the vending machine is operated locally by the
19 purchaser. One of the most widely known type of these vending
20 machines is the soft drink vending machine. The interface for a
21 soft drink vending machine consists of a currency acceptance
22 mechanism (coin slot and/or bill slot), a series of push buttons,
23 a beverage dispenser, and a coin return. These machines are
24 autonomous and do not depend on a remote location for normal
25 operations. Some newer vending machines may include an apparatus

1 for communicating with a remote location to signal that inventory
2 is low, but they are still autonomous in normal operation.

3
4 Some vending machines allow for payment with a credit/debit
5 card. These machines do not act autonomously. They must
6 communicate with a remote location in order to process a
7 transaction. Credit/debit card accepting vending machines include
8 ATM machines (which vend cash), airline ticket vending machines,
9 parking lot/garage payment machines, etc. These machines
10 generally include a more sophisticated interface than a soft drink
11 vending machine. They usually include a card reader, a video
12 display for displaying text or a combination of text and graphics
13 and a keypad for entering data. The keypad may be integrated into
14 a touch-responsive display. The display is used to prompt the
15 user for input which is entered via the keypad. The data obtained
16 from the keypad as well as from the card reader is transmitted to
17 a remote location where it is verified by a computer before the
18 transaction can be completed. Although the transaction requires
19 communication with a remote location, the transaction is effected
20 automatically without human intervention (other than that of the
21 purchaser). The impersonal nature of this transaction may be
22 considered an advantage in some situations.

23
24 U.S. Patent Number 4,845,636 to Walker discloses a remote
25 transaction system which may be used to conduct business

1 transactions wherein visual contact between a buyer and a seller
2 is desired or required. The Walker system provides two-way audio
3 and video communication between a purchaser and a human
4 representative of the seller so that the seller can observe the
5 buyer prior to completing the transaction. The Walker system also
6 includes a document reader so that the buyer can provide a
7 documentary form of identification for the seller's representative
8 to examine prior to authorizing the transaction. According to
9 Walker, his system is particularly useful for transactions which
10 require face-to-face communication between the buyer and the
11 seller. The sole example given by Walker of such a transaction is
12 where a rental car business must be able to observe a potential
13 user in order to assess the apparent capability of the user to
14 operate the automobile. As such, the Walker system is intended to
15 provide a similar human interaction to that which would otherwise
16 occur during a face-to-face transaction at a car rental counter.

17
18 It is imaginable by the inventors hereof that there are many
19 other types of possible vending machine transactions which would
20 require a more definite identification of the buyer than is
21 possible with the conventional ATM-type interface. For example,
22 vending of alcoholic beverages or tobacco should require a
23 verification of the buyer's age. Other types of transactions
24 might include the sale of certain types of over-the-counter
25 medication and other age-restricted products where it is necessary

1 or desired to accurately verify the buyer's age. This is not
2 entirely possible with an ATM-type interface for several reasons.
3 First, present databases for credit/debit cards do not typically
4 provide for age verification. Second, even if age could be linked
5 to a credit/debit account, an overly permissive parent might give
6 a card and password to an unsupervised child and avoid detection.
7 The Walker-type interface could satisfy the requirements of
8 vending which requires age verification. However, the Walker-type
9 interface presents a somewhat more personal interface than other
10 vending machine interfaces. In particular, the buyer is keenly
11 aware that his face and identification document(s) are being
12 verified by a human being who the buyer can see in a video
13 display. Moreover, the Walker-type interface is not likely to
14 increase product sales, as it is not designed for spontaneous
15 purchases.

16
17 The inventors hereof believe that it would be advantageous to
18 provide a vending machine of such novelty that it would increase
19 product sales. Moreover, the vending machine should be
20 particularly adapted to vend age-restricted products. One
21 potential manner to create the desired novelty and to verify the
22 age of a purchaser of age-restricted products would be to use a
23 vending machine capable of using artificial intelligence in a
24 manner sufficient to accurately verify the age of a purchaser in

1 order to approve or deny the purchase of such items. However,
2 such technology is not presently available.

3
4 SUMMARY OF THE INVENTION

5
6 It is therefore an object of the invention to provide a
7 vending machine particularly adapted to vend age-restricted items.

8
9 It is also an object of the invention to provide a vending
10 machine which is apparently autonomous.

11
12 It is another object of the invention to provide a vending
13 machine which is adapted to increase sales through its novelty and
14 function.

15
16 It is still another object of the invention to provide a
17 vending machine system in which a human being makes the final
18 decision as to whether to authorize a sale of an age-restricted
19 item to a potential buyer of the item.

20
21 In accord with these objects which will be discussed in
22 detail below, the vending machine according to the invention
23 includes a video camera for transmitting an image of a buyer to a
24 human remotely-located in a service center and in communication
25 with the vending machine, and a document reader for transmitting

1 an image of identification document(s) to the remotely-located
2 human in control of the vending machine. The vending machine also
3 includes a user interface which gives the appearance that the
4 machine is autonomous, a payment acceptor, and dispensing
5 apparatus.

6
7 According to the presently preferred embodiment, the user
8 interface includes a preferably computer-generated animation of a
9 character ("virtual character"), a speech synthesizer (or a
10 library of prerecorded synthetic sounding speech), and a user
11 input which includes a keypad and/or a microphone and voice
12 recognition software. Artificial intelligence software is
13 provided to complete as much of the transaction as possible before
14 the remotely-located human intervenes. However, before any
15 age-restricted item is dispensed to the buyer, the
16 remotely-located human must approve the purchase. Approval
17 includes verifying the validity of the purchaser's identification
18 document, the age of the purchaser, and optionally the sobriety of
19 the purchaser.

20
21 In addition, a camera is preferably provided to record the
22 item dispensed and the image is associated with an image of the
23 identification document.

1 In the interface using the virtual character, the character
2 may advantageously be programmed to interact with the buyer in an
3 entertaining manner, such as a friendly bartender or a brand
4 mascot (e.g., the Budweiser frogs).

5
6 Additional objects and advantages of the invention will
7 become apparent to those skilled in the art upon reference to the
8 detailed description taken in conjunction with the provided
9 figures.

10
11 BRIEF DESCRIPTION OF THE DRAWINGS

12
13 Figure 1 is a simplified block diagram illustrating a network
14 of vending machines coupled to a remotely-located service center
15 having a plurality of work stations;

16
17 Figure 2 is a side elevation of a first exemplary vending
18 machine according to the invention;

19
20 Figure 3 is a simplified block diagram of the components of a
21 vending machine according to the invention;

22
23 Figure 4 is a simplified diagram of one of the remote control
24 work stations;

1 Figure 5 is a simplified flowchart illustrating the
2 processing of a vending machine transaction according to the
3 invention;

4
5 Figure 6 is a simplified flowchart illustrating the role of
6 remote human control in the processing of a transaction;

7
8 Figure 7 is a first exemplary vending machine for dispensing
9 alcoholic beverages;

10
11 Figure 8 is a second exemplary vending machine for dispensing
12 tobacco products; and

13
14 Figure 9 is a third exemplary vending machine for dispensing
15 a variety of products, some of which do not require intervention
16 of remote human control.

17
18 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

19
20 Referring now to Figure 1, a vending machine network 10
21 according to the invention includes a plurality of vending
22 machines 12a, 12b, 12c, ..., 12n coupled via a communications
23 network 14 to a remotely-located service center 16. The service
24 center 16 includes a plurality of work stations 18a, 18b, ..., 18m
25 each manned by a human worker. Each work station is preferably

1 capable of communicating with all of the vending machines on the
2 network 14. The network connection 14 between the vending
3 machines and the service center is preferably in Internet Protocol
4 (IP) and over either the Internet or a private network.

5
6 As described in more detail below with reference to Figures 2
7 and 3, an important feature of the invention is that the vending
8 machines include video capture devices for capturing images of the
9 buyer and the buyer's driver's license. However, the
10 communications link between the vending machines and the service
11 center does not need to be very broad band because image data
12 acquired by the vending machines only need be compressed still
13 images, not streaming video. However, if a broadband link is
14 readily and economically available, streaming video of the buyer
15 will provide additional information which can be used by the human
16 in deciding whether to approve a transaction, as discussed below.

17
18 Turning now to Figures 2 and 3, a vending machine 12
19 according to the invention includes a processor 20 which receives
20 input from a video capture device 22 for capturing an image of the
21 buyer and optionally a microphone 24 for voice recognition
22 processing of the vending transaction. The processor 20 also
23 receives input from a card reader 26 (and/or a currency reader)
24 for accepting payment and a document reader 28 for capturing a
25 video image of a driver's license or other form of identification.

1 The processor 20 provides output to a video display 30 and a
2 speaker 32 which present the buyer with an "artificial
3 intelligence" interface to the vending machine. The interface
4 preferably includes an animated character on the video display,
5 such as a friendly bartender or a brand mascot (e.g., the
6 Budweiser frogs). The vending machine also appears to a buyer to
7 operate entirely autonomously under "artificial intelligence".
8 The processor 20 communicates bidirectionally with the vending
9 machine mechanics 34 (e.g. dispensing solenoids, card insertion
10 sensors, etc.) and with the communications link 36 for
11 communicating with the service center. The vending machine 12 is
12 adapted to store and vend age-restricted items 38.

13
14 An exemplary service center work station 18 is illustrated in
15 Figure 4. The work station 18 preferably includes a video display
16 and one or more input devices, e.g. keyboard 42 and mouse 44.
17 According to the invention, the video display 40 is divided into
18 fields for displaying different information. For example, one
19 field 46 displays a picture of the buyer as captured by the video
20 capture device 26 in the vending machine 12. Another field 48
21 preferably displays an image of the buyer's driver's license or
22 other photoidentification as captured by the document reader 28 in
23 the vending machine. According to a presently preferred
24 embodiment, the display 40 also includes a field 50 for displaying
25 an image of an exemplary valid driver's license or other

1 photoidentification from the same jurisdiction as indicated by the
2 buyer's driver's license. The display also includes a field 53
3 for displaying the purported age of the buyer, a field 54 for
4 displaying a percentage probability that the buyer's
5 photoidentification is valid, a field 56 for displaying a
6 percentage probability that the buyer is the person shown in the
7 photoidentification; i.e., a biometric analysis validity
8 percentage, and a field 58 for displaying a percentage probability
9 that the buyer is sober. Field 53, 54, 56 and 58 are discussed
10 further below. Optionally, the display includes an information
11 field 52 for displaying information such as the identification of
12 the vending machine and the nature of the transaction.

13
14 Figure 5 illustrates the general sequence of operations in a
15 vending machine according to the invention. According to the
16 presently preferred embodiment, starting at 60, the vending
17 machine detects (either via the video capture device or a motion
18 detector) when a prospective purchaser is near the machine at 62.
19 If someone is in the vicinity, the vending machine signals an
20 alert at 64. The alert is preferably a synthesized voice message
21 advertising goods which may be purchased through the vending
22 machine or which otherwise attempt to engage a potential
23 purchaser. For example, in the case of a beverage vending
24 machine, the voice message might be "Hello, would you like a cold
25 drink?" The alert may be any other message which operates to

1 increase the novelty of the device and increase sales. As such,
2 the alert may be a humorous message not even related to the items
3 in the vending machine but which nevertheless operate to gain and
4 retain the attention of a potential purchaser. If customer input
5 is detected at 66, by detecting a customer response, most of the
6 transaction is processed autonomously at 68. For example, the
7 customer selects the item for purchase and tenders payment in
8 either cash or credit/debit card in response to prompts from the
9 vending machine. If a credit/debit card was tendered, the vending
10 machine will validate the card using the normal methods of
11 communicating with a card center. If the item(s) selected for
12 purchase require proof of age, the vending machine will prompt the
13 buyer to insert a driver's license (or similar form of
14 photoidentification) into the document reader 28. The vending
15 machine will pre-authorize the transaction if the payment method
16 has been approved and if the proof of age has been produced if
17 required. If the payment method was not authorized or required
18 proof of age was not tendered, the vending machine will
19 automatically deny the transaction. Preferably, a synthesized
20 voice message will be played. For example, "I'm sorry but your
21 credit card is expired." or "I'm sorry, the transaction you have
22 chosen requires proof of age." If the transaction does not
23 require proof of age as determined at 70 in Figure 5, the vending
24 machine completes the transaction at 72 without human intervention
25 from the remote service center. If it is determined at 70 that

1 proof of age is required and proof of age has been tendered to the
2 document reader, the vending machine utilizes artificial
3 intelligence routines at 73 to: calculate a percentage probability
4 that the buyer's photoidentification is valid at 73A, to calculate
5 a percentage probability that the buyer is the person shown in the
6 photoidentification at 73B, and to calculate a percentage
7 probability that the buyer is sober at 73C. Artificial
8 intelligence routines are discussed in previously incorporated
9 U.S. Serial No. 09/657,719. The vending machine then contacts the
10 remote service center to alert a human operator that approval is
11 required at 74 and provides the calculated probabilities thereto
12 on the video display 40 (as indicated at 53, 54, 56 and 58 in
13 Fig. 4). The transaction will be concluded under supervision of
14 the remote human as indicated at 76 and described in further
15 detail with reference to Figure 6.

16
17 Referring now to Figure 6, when an alert (or page) is
18 detected at 80, one of the unoccupied human operators at the
19 service center responds, and the video display 40 of the operator
20 terminal 18 displays preferably all of the information shown in
21 Figure 4.

22
23 The operator determines the age indicated on the
24 photoidentification at 82. The vending machine preferably reads

1 the age from the photoidentification and displays the age at 53
2 (Fig. 4) for the convenience of the operator.

3
4 If the age on the photoidentification is above the legal age
5 for the purchase, the operator determines whether the
6 photoidentification is valid at 86. The operator uses a selected
7 photoidentification sample (e.g., sample 50 in Fig. 4) at 86a
8 (matching the jurisdiction of the buyer's photoidentification),
9 and visually compares the buyer's photoidentification with the
10 sample at 86b. According to the presently preferred embodiment of
11 the invention, the operator's work station is provided access to
12 an image library containing images of valid photoidentifications,
13 e.g., driver's licenses from various jurisdictions (e.g. the fifty
14 states and the District of Columbia) and optionally international
15 passports and/or other photoidentifications. The operator selects
16 an image of a sample valid photoidentification from the same
17 jurisdiction as the photoidentification presented by the buyer.
18 The operator compares the photoidentification sample to the
19 buyer's photoidentification at 86b to determine whether the
20 buyer's photoidentification is genuine. For example, typeface and
21 the placement of critical elements are examined. In addition, the
22 operator is aided by a software calculated probability that the
23 buyer's photoidentification is valid at 86c; i.e., the software
24 searches for features such as holograms, watermarks, the absence

1 of added adhesives or cut lines, etc., which indicate validity or
2 invalidity of the identification.

3
4 The operator also determines at 88 whether it is the buyer
5 who is pictured in the photoidentification presented by the buyer.
6 The vending machine takes a video image of the buyer and transmits
7 the image to the terminal 18 for comparison with the
8 photoidentification. If the buyer is not looking into the video
9 capture device, the operator can trigger a synthesized voice
10 prompt asking the buyer to look at the camera; i.e., it appears to
11 the buyer that the vending device, and not a human, is requesting
12 the buyer to look at the camera. The operator compares the
13 buyer's image to the photo image on the photoidentification at 88a
14 and also uses a biometric analysis at 88b. The biometric
15 analysis, using known biometric parameters, provides a percentage
16 probability that the buyer is the same person in the
17 photoidentification.

18
19 In addition, according to a preferred but optional step, the
20 operator also determines, from the video image of the buyer and
21 from the calculated probability provided by artificial
22 intelligence routines, whether the buyer is sober at 90 prior to
23 completing a purchase transaction for an alcoholic beverage. This
24 can be done by visual examination at 90a, by software routine
25 discriminators at 90b, and/or by tests of motor skills, response

1 time, and/or visual acuity which are performed using the video and
2 audio elements of the vending machine at 90c. For example, a
3 potential purchaser of alcoholic beverages may be requested to
4 touch one or more spots on a touch-sensitive display after a tone
5 is heard. Either the vending machine or the human operator can
6 determine whether a potential purchaser 'passes' the test.

7
8 If the operator concludes that the buyer is over the age
9 required for the purchase at 82, has a valid photoidentification
10 at 86, is the same person as pictured in the photoidentification
11 at 88, and is sober 90, the operator authorizes the transaction at
12 92. It is recognized that the operator can perform any of the
13 steps required to authorize the transaction in an order different
14 from that described above.

15
16 If the photoidentification is determined to be genuine, the
17 operator authorizes the transaction at 92 and optionally an
18 audio/video message is provided by the vending machine indicating
19 the purchase approval and thanking the buyer for the purchase. If
20 any of the tests fail (age too young, counterfeit license, image
21 mismatch, insobriety), the operator denies the transaction at 94,
22 and an audio/video message is provided by the vending machine
23 indicating the reason for denial of the purchase.

24

1 It is a desirable aspect of the invention that the
2 participation of the remote human operator is completely invisible
3 and inaudible to the buyer. From the buyer's perspective, the
4 entire transaction is completed autonomously by the vending
5 machine presumably using artificial intelligence. Thus, if it is
6 necessary for the operator to communicate with the buyer, it is
7 preferably done through synthesized speech or prerecorded phrases
8 which sound like they are machine generated. The use of human
9 operators at a centralized service center permits uniform training
10 and testing of each operator prior to giving the operator
11 authority to approve or deny transactions.

12
13 If the transaction is approved, it is preferable that a
14 record of each transaction be maintained in a database, preferably
15 in a computer at the service center. The record preferably
16 includes pictures of the buyer and his or her photoidentification,
17 pictures of the product vended, an electronic record of when and
18 where the product was sold, and preferably a distinct
19 identification number assigned to the transaction. The record
20 serves multiple purposes. First, should an accusation be made
21 that a product was vended to an underage individual, the record
22 verifies the steps taken to ensure that the product was vended to
23 an age-appropriate individual. Second, the record can be used to
24 remotely indicate the product sold so that a vendor may refill
25 product vended when supply is low. Third, the record provides

1 valuable marketing data: the age of persons purchasing particular
2 products, where particular products sell best, etc.

3
4 With the above vending machine system, appropriate, legal,
5 and consistent sales of age-restricted items are accomplished
6 using a device adapted to attract the attention of potential
7 purchasers and engage the potential purchaser through completion
8 of a vending transaction.

9
10 Figures 7-9 illustrate other exemplary vending machines
11 according to the invention. Figure 7 illustrates a "virtual
12 bartender" machine 100. The machine preferably includes
13 illuminated indicia 102 and advertising 104 which indicate to
14 potential buyers what kind of beverages may be purchased from the
15 machine. According to this embodiment, the machine 100 is also
16 provided with a video display 106 for displaying a computer
17 generated character, a video camera 108 for capturing an image of
18 the buyer, a speaker 110 for playing the synthesized voice of the
19 computer generated character, and a microphone 112 for voice
20 recognition of the buyer. In addition, the machine 100 has a card
21 payment slot 114, a driver's license slot 116, and a scrolling
22 display of available beverage selections 118. As shown in Figure
23 3, the dispensing portion 120 of the machine 100 include a cup
24 dispenser similar to state of the art coffee and soft drink
25 vending machines. A cup disposal 122 is provided to collect empty

1 cups from buyers who finish their drink while near the machine.
2 Although the advertising 104 suggests only beer and spirits, soft
3 drinks may be vended from the same machine. The machine operates
4 according to the procedures described above with reference to
5 Figures 5 and 6. More particularly, the computer generated
6 character in the display 106 may be programmed to look and act
7 like a caricature of a stereotypical bartender. The audio played
8 to accompany the character may also be programmed to say things
9 stereotypical of a bartender, e.g. to tell jokes and/or act as a
10 counselor in a manner similar to the famous "Eliza" artificial
11 intelligence simulation. The virtual bartender machine 100 may be
12 placed in any suitable location. One advantageous application for
13 the virtual bartender would be to place several throughout an
14 airport, all coupled to the same network and controlled by a fewer
15 number of human operators. It will be appreciated that in some
16 applications ambient noise may prohibit voice recognition. In
17 such applications, the microphone 112 may be omitted and one or
18 more manual input devices supplied.

19
20 Figure 8 illustrates a "virtual tobacconist" vending machine
21 200. The vending machine 200 preferably includes illuminated
22 indicia 202, 204 which serve to identify what goods are available
23 for purchase and act as advertising. This embodiment does not
24 include a video display, but it does include a camera 206, a
25 speaker 208, and a microphone 210. In addition to a payment card

1 slot 212 and a driver's license slot 214, the machine 200 also
2 includes a currency slot 216. The goods are delivered via the
3 dispensing chute 218. It will be appreciated that the machine can
4 be programmed to dispense individual packets of cigarettes or
5 cartons of cigarettes or both according to the buyer's order. It
6 will also be appreciated that if a transaction is canceled or not
7 approved after currency has been placed in the currency slot,
8 currency may be refunded via the dispensing chute 218.

9
10 It will be appreciated that features from the virtual
11 tobacconist and the virtual bartender may be interchanged. The
12 common feature of both of these machines and all of the vending
13 machines according to the invention is that they present an
14 interface to the buyer which appears to be completely non-human
15 when, in reality, restricted transactions are secretly approved or
16 denied by a remotely-located human operator.

17
18 Vending machine 300 of Figure 9 includes displays for a
19 variety of products including snack food 302, toiletries 304, soft
20 drinks 306, beer 308, liquor 310, and cigarettes 312; i.e., both
21 non-age-restricted and age-restricted products. The machine also
22 includes a video display 314, a camera 316, a speaker 318, and an
23 optional microphone 320. Slots are provided for a payment card
24 322, a driver's license 324, and currency 326. Products are
25 dispensed via the chute 328. The machine 300 operates in a manner

1 as described above with reference to Figures 5 and 6. The
2 displays 302-312 may be touch sensitive such that upon selecting
3 one category of products, a menu of available products is
4 displayed on the video display 314 or spoken in a synthesized
5 voice through the speaker 318. As mentioned above with reference
6 to Figure 5, only some of the possible transactions will require
7 identification and remote human intervention. This multipurpose
8 vending machine is well suited for application in a small hotel or
9 motel where shops for these products are not available.
10

11 There have been described and illustrated herein several
12 embodiments of a vending machine adapted to vend age-restricted
13 items. While particular embodiments of the invention have been
14 described, it is not intended that the invention be limited
15 thereto, as it is intended that the invention be as broad in scope
16 as the art will allow and that the specification be read likewise.
17 It will therefore be appreciated by those skilled in the art that
18 yet other modifications could be made to the provided invention
19 without deviating from its spirit and scope as so claimed.
20